

Tactical Control System (TCS) to Closed Circuit Television (CCTV) System Interface Design Description



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CHANGE RECORD					
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TACTICAL CONTROL SYSTEM (TCS) TO CLOSED CIRCUIT TELEVISION (CCTV) SYSTEM INTERFACE DESIGN DESCRIPTION					TCS 205

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(NONE)

1. Scope.

1.1 Identification.

This Tactical Control System (TCS) Interface Design Description (IDD) Version 1.1 identifies, specifies, and establishes the baseline for the detailed interface requirements between the TCS and the Closed Circuit Television (CCTV) System (9TV and 23TV Versions) for the Command, Control, Communications, Computers, and Intelligence (C⁴I) system as set forth by both the TCS System/Subsystem Specification (SSS) Version 1.0 and the TCS System/Subsystem Design Description (SSDD) Version 1.0. This IDD is written to comply with TCS Operational Requirements Document (ORD) Requirement Number ORD069. This IDD specifies requirements levied on the TCS, and does not impose any requirements on the C⁴I System addressed in this document. This IDD further specifies the methods to be used to ensure that each system interface requirement has been met. This IDD is published in accordance with Data Item Description (DID) DI-IPSC-81436, dated 941205, and modified to incorporate the qualification provisions section that is traditionally found in the Interface Requirements Specification (IRS). This IDD will be revised at the conclusion of the Program Definition and Risk Reduction period of the TCS program and will be re-issued in final form to be used during the follow-on TCS Engineering and Manufacturing Development period.

1.2 System Overview.

The purpose of the TCS is to provide the military services with a single command, control, data receipt, data processing, data export and dissemination capability that is interoperable with the family of all present and future tactical unmanned aerial vehicles and designated C⁴I systems. These UAVs include the Tactical Unmanned Aerial Vehicle (TUAV) and the Medium Altitude Endurance (MAE) UAV (henceforth referred to as Outrider and Predator respectively), with their associated payloads. Designated C⁴I and other systems that TCS will be interoperable with are detailed in paragraph 1.2.2.4 below. TCS will also be capable of receiving and processing information from High Altitude Endurance (HAE) UAVs and their associated payloads, as well as being capable of providing interoperability with future development tactical UAVs and payloads.

1.2.1 TCS Program, Phases, and UAV Interaction.

The Unmanned Aerial Vehicle Joint Project Office (UAV JPO) has undertaken development of a TCS for UAVs. Design and development of the TCS will be conducted in two phases. Phase 1 is defined as the Program Definition and Risk Reduction phase, and Phase 2 is defined as the Engineering and Manufacturing Development phase in accordance with Department Of Defense Instruction (DoDI) - 5000.2R. During Phase 2, TCS Low Rate Initial Production (LRIP) will commence. Phase 1 will be a 24-month period and will demonstrate Level 1 through Level 5 interaction (as defined below) in an Incremental and Evolutionary strategy as described in accordance with MIL-STD-498. The five discrete levels of multiple UAV interaction to be provided by the TCS are:

Level 1: receipt and transmission of secondary imagery and/or data.

Level 2: direct receipt of imagery and/or data.

Level 3: control of the UAV payload in addition to direct receipt of imagery/data.

Level 4: control of the UAV, less launch and recovery, plus all the functions of Level 3.

Level 5: capability to have full function and control of the UAV from takeoff to landing.

1.2.2 Tactical Control System Overview.

The TCS is the software, software-related hardware and the extra ground support hardware necessary for the control of the TUAV, the MAE UAV, and future tactical UAVs. The TCS will also provide connectivity to specific C⁴I systems as outlined in paragraph 1.2.2.4. TCS will have the objective capability of receiving HAE UAV payload information. Although developed as a total package, the TCS will be scaleable to meet the user's requirements for deployment. TCS will provide a common Human-Computer Interface (HCI) for tactical airborne platforms to simplify user operations and training, and to facilitate seamless integration into the Services' joint C⁴I infrastructure across all levels of interaction.

1.2.2.1 Software.

The major focus of the TCS program is software. The software will provide the UAV operator with the necessary tools for computer-related communications, mission tasking, mission planning, mission execution, data receipt, data processing, limited data exploitation, and data dissemination. The software will provide a high-resolution, computer-generated graphics user interface that enables a UAV operator trained on one system to control different types of UAVs or UAV payloads with a minimum of additional training. The TCS will operate in an open architecture and be capable of being hosted on computers that are typically supported by the

using Service. Software developed will be Defense Information Infrastructure/Common Operating Environment (DII/COE) compliant, non-proprietary, and the architectural standard for all future tactical UAVs. To the extent possible, the TCS will use standard DoD software components to achieve commonality. TCS will provide software portability, scaleable functionality, and support for operational configurations tailored to the users' needs.

1.2.2.2 Hardware.

To the extent possible, the TCS will use standard Department of Defense (DoD) hardware components in order to achieve commonality. The TCS will use the computing hardware specified by the service specific procurement contracts. Each individual service will identify TCS computing hardware, the desired level of TCS functionality, the battlefield C⁴I connectivity, and the particular type of air vehicle and payloads to be operated depending upon the deployment concept and area of operations. TCS hardware must be capable of being scaled or modularized to meet varying Service needs. TCS hardware will permit long-range communications from one TCS to another, data storage expansion, access to other computers to share in processing capability, and multiple external peripherals.

1.2.2.3 System Compliance.

The TCS will be developed in compliance with the following military and commercial computing systems architecture, communications processing, and imagery architecture standards:

- a. Department of Defense Joint Technical Architecture (JTA), including, but not limited to:
 - Variable Message Format (VMF) and Joint Message Format (JMF)
 - National Imagery Transmission Format (NITF)
- b. Defense Information Infrastructure/Common Operating Environment
- c. Computer Open Systems Interface Processor (COSIP)
- d. Common Imagery Ground/Surface System (CIGSS) segment of the Distributed Common Ground Station (DCGS).

1.2.2.4 TCS Integration with Joint C⁴I Systems.

TCS will be capable of entering DII/COE compliant networks. TCS integration with C⁴I systems will be accomplished through development of interfaces that permit information exchange between the TCS and specified C⁴I systems.. Network interoperability will include but not be limited to:

Advanced Field Artillery Tactical Data System (AFATDS)

Advanced Tomahawk Weapons Control System (ATWCS)
Air Force Mission Support System (AFMSS)
All Source Analysis System (ASAS)
Army Mission Planning System (AMPS)
Automated Target Handoff System (ATHS)
Closed Circuit Television (CCTV)
Common Operational Modeling, Planning and Simulation Strategy (COMPASS)
Contingency Airborne Reconnaissance System (CARS)
Enhanced Tactical Radar Correlator (ETRAC)
Guardrail Common Sensor/Aerial Common Sensor (ACS) Integrated Processing Facility (IPF)
Intelligence Analysis System (IAS)
Joint Deployable Intelligence Support System (JDISS)
Joint Maritime Command Information System (JMCIS)
Joint Service Imagery Processing System - Air Force (JSIPS)
Joint Service Imagery Processing System - Navy (JSIPS-N)
Joint Surveillance Target Attack Radar System (JSTARS) Ground Station Module/Common Ground Station (GSM/CGS)
Modernized Imagery Exploitation System (MIES)
Tactical Aircraft Mission Planning System (TAMPS)
Tactical Exploitation Group (TEG)
Tactical Exploitation System (TES)
Theater Battle Management Core System (TBMCS)
TROJAN Special Purpose Integrated Remote Intelligence Terminal (SPIRIT) II

The TCS will export and disseminate UAV imagery products, tactical communication messages, mission plans, and target coordinates. TCS will also receive, process, and display tasking orders and operational information from Service-specific mission planning systems.

1.2.3 CCTV System Overview .

The CCTV system is one of several Navy C⁴I systems which is used as a display/briefing system. The CCTV system provides one-way video and two-way audio capability. Currently two variants of the CCTV system, 9TV and 23TV are resident on various Navy platforms.

1.3 Document Overview.

The purpose of this document is to provide the interface description between the TCS and the CCTV System(s). This document was developed using MIL-STD-498 (Data Item Description DI-IPSC-84136) as a guide, and is divided into the following sections:

- | | |
|------------|--|
| Section 1 | <u>Scope</u> : Identifies the systems, interfacing entities, and interfaces addressed in this document, with a brief overview of each. |
| Section 2 | <u>Referenced Documents</u> : Lists all referenced documents applicable to this development effort. |
| Section 3 | <u>Interface Design</u> : Identifies and describes the characteristics of the interface(s) defined in this document. |
| Section 4 | <u>Requirement Traceability and Qualification Provisions</u> : Defines the requirement traceability to the TCS SSDD, and also defines the qualification methods which are used to ensure that each requirement of this interface has been met. |
| Section 5 | <u>Notes</u> : Provides background information regarding the specific C ⁴ I system addressed, and a list of acronyms and abbreviations used in this document. |
| Appendices | As applicable to provide referenced data (None for this IDD). |

2. **Referenced Documents.**

2.1 **Government Documents.**

The following documents of the exact issue shown form part of this IDD to the extent specified herein. In the event of conflict between the documents referenced herein and the content of this IDD, the content of this IDD will be considered a superseding requirement.

2.1.1 **Specifications.** None

Military

TCS 102 30 June 1997	Tactical Control System, System/Subsystem Specification, Version 1.0
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TCS 104 Date - TBD	Tactical Control System, System/Subsystem Design Description, Version 1.0
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2.1.2 **Standards.**

Federal - None

Military

MIL-STD-498 5 Dec. 1994	Software Development and Documentation Standard
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Other Government Agency - None

2.1.3 **Drawings.** None

2.1.4 **Other Publications.**

Reports

NSWCDD/96-XX 9 Dec. 1996	Operational Concept Document for the TCS (Draft)
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JROCM 011-97 3 Feb. 1997	Tactical Control System, Operational Requirements Document, Version 5.0
TCS 233 July 1997	Tactical Control System Joint Interoperability Interface 2, Version 1.0, TCS to Service C ⁴ I Systems
DoD JTA Ver 1.0 22 Aug. 1996	DoD Joint Technical Architecture, Version 1.0
DISA XXX.XX 31 Oct. 1996	DII/COE Baseline Specifications Version 3.0 (Series)
DISA XXX.XX January 1997	DII/COE Integration and Runtime Specification (I&RTS), Version 3.0

Regulations - None

Handbooks - None

Bulletins - None

2.2 Non-Government Documents.

The following documents of the exact issue shown form part of this IDD to the extent specified herein. In the event of conflict between the documents referenced herein and the content of this IDD, the content of this IDD will be considered a superseding requirement.

2.2.1 Specifications. None

2.2.2 Standards.

EIA RS-170 Nov. 1957	Electrical Performance - Monochrome Television
EIA RS-170A (SMPTE 170M) 1994	Television Composite Analog Video Signal - NTSC

2.2.3 Drawings. None

2.2.4 Other Publications. None

3. Interface Design.

3.1 Interface Identification/Diagram.

This IDD specifies the design characteristics of the interface between the TCS and the CCTV system as shown in Figure 3.1-1, TCS to CCTV Interface Block Diagram.

3.2 TCS to CCTV Interface.

3.2.1 Priority of Interface. (Not Applicable)

3.2.2 Type of Interface.

There will be a single interface between the TCS and CCTV system. This interface shall be uni-directional from the TCS to the CCTV system [C4I205001]. The TCS will export/disseminate payload video (raw and/or annotated) to the CCTV system.

3.2.3 Individual Data Element Characteristics. (Not Applicable)

3.2.4 Data Element Assembly Characteristics. (Not Applicable)

3.2.5 Communication Methods Characteristics.

TCS receives video imagery from various Aerial Vehicles (AVs) in different formats. TCS shall transfer this video to the CCTV System via a standard coaxial cable utilizing the RS-170A format [C4I205002] or the Phase Alternate Line (PAL) format [C4I205003] (European video transmission format) with associated communications methods, dependent on the AV video being received.

TCS shall also provide this video to the CCTV System with overlay data (annotation) utilizing the RS-170A format [C4I205004] or the PAL format [C4I205005]. The annotation data will consist of the following parameters:

- UAV Latitude, Longitude, Altitude, True Heading, Airspeed
- Target Latitude, Longitude, Altitude (center point of payload field of view)
- Slant Range - UAV-Target
- Indicated North Position; GPS Time

Payload Type, Bearing Angle, Depression Angle, Zoom Setting

3.2.6 Protocol Characteristics. (Not Applicable)

3.2.7 Other Characteristics.

The video interface between the TCS and the CCTV system shall be implemented with an RG-59/U standard coaxial cable and BNC connectors [C4I205006]. Amplification and/or cable modifications may be required depending on the specific platform details and requirements. Figure 3.2.7-1, TCS Video Distribution Architecture Concept, depicts a sample architecture for a typical ship platform video distribution system using CCTV.

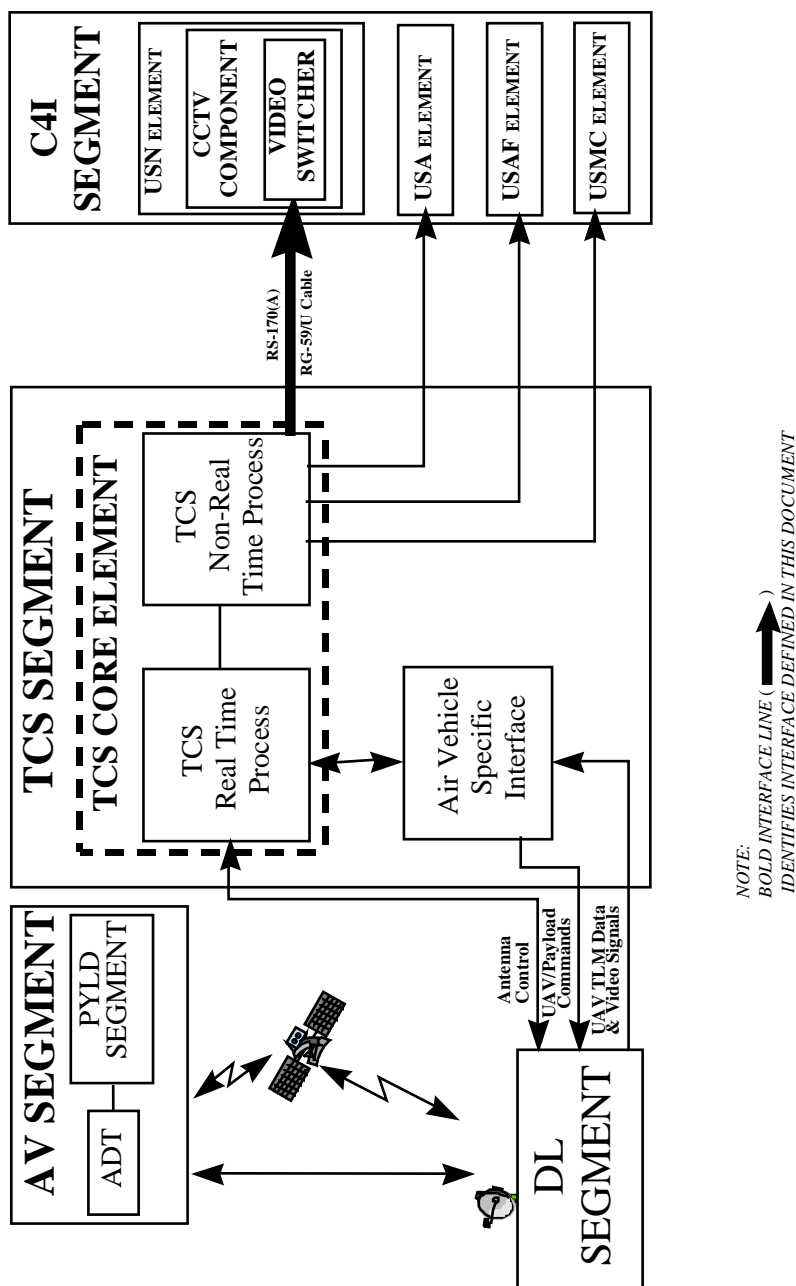


FIGURE 3.1-1 TCS to CCTV Interface Block Diagram

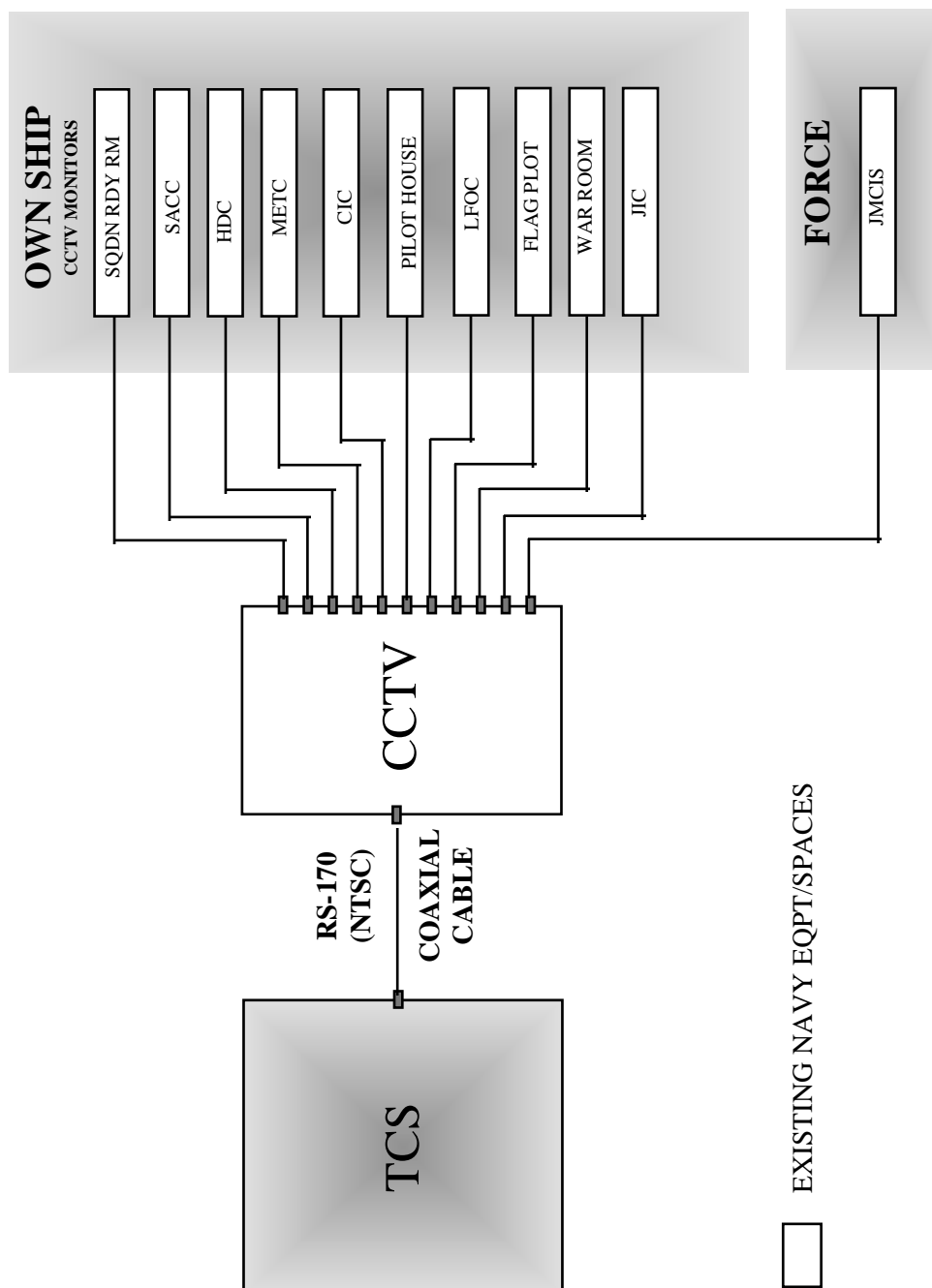


FIGURE 3.2.7-1 TCS Video Distribution Architecture Concept

4. Requirement Traceability and Qualification Provisions.

This section defines the traceability of each C⁴I requirement in this IDD, as shown in Table 4.0-1 below, to the TCS SSDD requirements specified in the TCS SSDD Baseline Version 1.0. This section also defines the qualification methods to be used to ensure that each requirement of this interface has been met. These qualification methods are defined as:

D	Demonstration	The operation of the interfacing entities that relies on observable functional operation not requiring the use of instrumentation, special test equipment, or subsequent analysis.
T	Test	The operation of the interfacing entities using instrumentation or special test equipment to collect data for later analysis.
A	Analysis	The processing of accumulated data obtained from other qualification methods. Examples are reduction, interpretation, or extrapolation of test results.
I	Inspection	The visual examination of code, documentation, etc.
S	Special	Any special qualification methods such as special tools, techniques, procedures, facilities, and acceptance limits.

Table 4.0-1 lists each requirement of the TCS-to-CCTV interface with its C⁴I IDD requirement number, traceability to the SSDD, the IDD paragraph number where the requirement is found, and the qualification method.

TABLE 4.0-1 TCS-to-CCTV REQUIREMENT TRACEABILITY AND QUALIFICATION METHODS				
IDD Requirement Number	Requirement	Paragraph Number	SSDD Req.(s)	Qualification Method(s)
C4I205001	Uni-directional interface (TCS to CCTV)	3.2.2	TBD	A, D
C4I205002	Transfer RS-170A video	3.2.5	TBD	D
C4I205003	Transfer PAL video.	3.2.5	TBD	D
C4I205004	Provide annotated RS-170A video.	3.2.5	TBD	D
C4I205006	Provide annotated PAL video.	3.2.5	TBD	D
C4I205006	RG-59/U Cable terminated in BNC connector.	3.2.7	TBD	I, T

5. Notes.

5.1 Background Information.

The CCTV system is one of several Navy C⁴I systems that will be provided payload video in the RS-170A format. The other systems and their interfaces are defined in other IDD's specific to each system as part of the TCS design and development program.

CCTV is the display/briefing system utilized by the United States Navy, and provides one-way video and two-way audio capability. Currently there are two variants of CCTV that are resident on the various Navy ships. These are the 9TV System and the 23TV System.

5.1.1 9TV System.

The AN/SXQ-8 audio/video switcher is designated as the 9TV System. The original requirement for this system was to function as a pilot briefing system. It was designed to allow Intel Center personnel to give secure/nonsecure briefs to personnel in the Ready Rooms, and has evolved into a system with up to 30 inputs and 30 outputs. This is a low-resolution video switcher, designed to handle video inputs (i.e. cameras, VCR's, TV tuners, character generators, & etc.) in National Transmission Standards Committee (NTSC) format. Any video signal having resolution greater than NTSC will require scan conversion. The reserved inputs and outputs on the 9TV Systems are limited, with most ships utilizing the full capability. The following platforms currently have the 9TV System installed:

LHA's

#3 USS Belleau Wood
#5 USS Peleliu

LHD's

#1 USS Wasp
#2 USS Essex
#4 USS Boxer

LCC's

#20 USS Mount Whitney

CARRIERS

CV-62 USS Indy
CV-63 USS Kitty Hawk
CV-67 USS JFK
CVN-68 USS Nimitz
CVN-70 USS Vinson
CVN-71 USS Roosevelt
CVN-72 USS Lincoln

CVN-73 USS Washington
CVN-74 USS Stennis

5.1.2 23TV System.

The JMCIS Integrated Video Subsystem (IVS) is a video distribution switcher designated as the 23TV System. It is a replacement for the AN/SXQ-8 (9TV) System and the JMCIS NTCS-A video switcher. The IVS 23TV System is a 125 MHz RGB video switcher designed to provide the development, processing and routing of a variety of video formats, including NTSC, PAL, and Rasterscan RS-170 (15-80 kHz). It has a two-way audio feature, and can handle all secure (RED) audio/video applications. The system has the capability for up to 48 inputs and 96 outputs.

Inputs to the 23TV System are provided from high-resolution tactical computers, radars, cameras, various types of videocassette recorders, slide-to-video converters, character generators, flir video and feeds from various video systems. Figure 5.1.2-1 indicates typical IVS inputs.

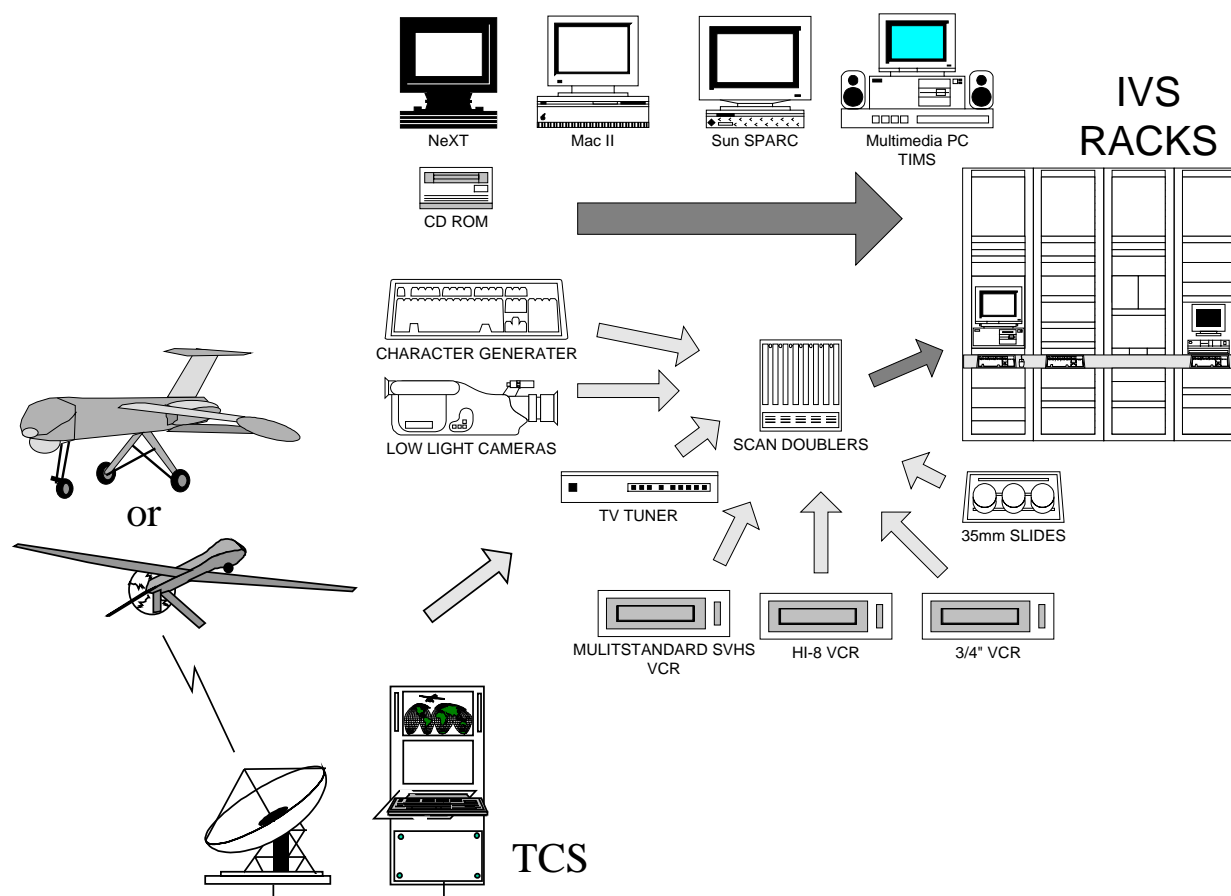


Figure 5.1.2-1 Typical IVS Inputs

Outputs of the 23TV System are provided to high-resolution monitors ranging in size from 17" to 37" and color large screen displays, with certain 17" monitors being dual used for TIMS and IVS. Figure 5.1.2-2 indicates the typical IVS outputs.

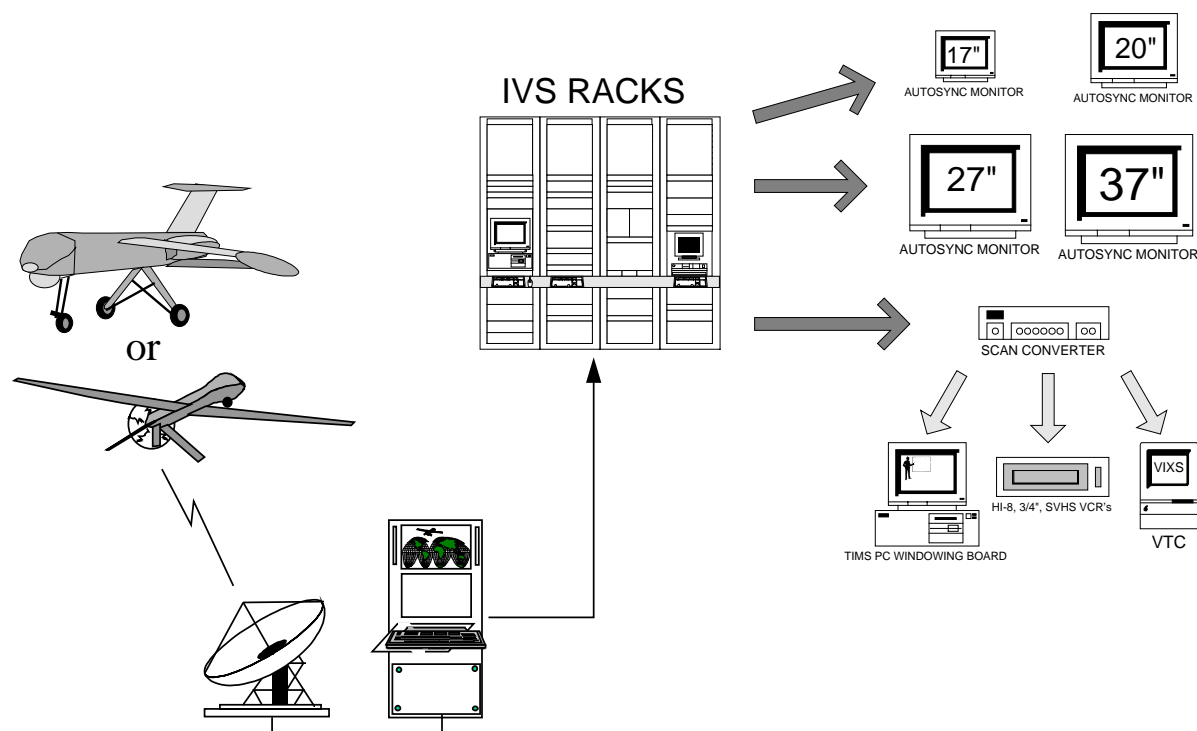


Figure 5.1.2-2 Typical IVS Outputs

The IVS 23TV System relays intelligence and operational information to the Flag Commander, Commanding Officers, Combat Spaces, and Ready Rooms. Current Navy plans are to procure approximately 3 systems per year for the next 8 years. The following platforms currently have the 23TV System installed:

LHD's

- #3 USS Kearsarge (switcher size: 40x40)
- #6 USS Richard (scheduled completion fall 97)

CARRIERS

- CVN-64 USS Constellation (switcher size: 40x56)
- CVN-65 USS Enterprise (switcher size: 48x62)
- CVN-69 USS Eisenhower
- CVN-75 USS Truman

COMMAND SHIPS

- AGF-11 USS Coronado (switcher size: 40x72)

5.2 Acronyms and Abbreviations.

A	Analysis
ACS	Aerial Common Sensor
ADT	Air Data Terminal
AFATDS	Advanced Field Artillery Tactical Data System
AFMSS	Air Force Mission Support System
AMPS	Army Mission Planning System
ASD	Assistant Secretary of Defense
ASAS	All Source Analysis System
ATHS	Automated Target Handoff System
ATWCS	Advance Tactical Weapons Control Station
AV	Aerial Vehicle
C ⁴ I	Command, Control, Communication, Computers, and Intelligence
CARS	Contingency Airborne Reconnaissance System
CCTV	Closed Circuit Television
CD	Compact Disk
CGS	Common Ground Station
CIC	Combat Information Center
CIGSS	Common Imagery Ground/Surface System
COE	Common Operating Environment
COMPASS	Common Operational Modeling, Planning and Simulation Strategy
COSIP	Computer Open Systems Interface Processor
D	Demonstration
DCGS	Distributed Common Ground Station
DID	Data Item Description
DII	Defense Information Infrastructure
DISA	Defense Information Systems Agency
DL	Data Link
DoD	Department of Defense
DoDI	Department of Defense Instruction
EIA	Electronic Industry Association
ETRAC	Enhanced Tactical Radar Correlator
EQPT	Equipment
GSM	Ground Station Module
HAE	High Altitude Endurance
HCI	Human Computer Interface
HDBK	Handbook
HDC	Helicopter Direction Center

I	Inspection
IAS	Intelligence Analysis System
IDD	Interface Design Description
IPF	Integrated Processing Facility
IRS	Interface Requirements Specification
I&RTS	Integration and Runtime Specification
IVS	Integrated Video Subsystem
JDISS	Joint Deployable Intelligence Support System
JIC	Joint Intelligence Center
JMCIS	Joint Maritime Command Information System
JMF	Joint Message Format
JPO	Joint Program Office
JROC	Joint Requirements Oversight Council
JSIPS	Joint Service Imagery Processing System (Air Force)
JSIPS-N	Joint Service Imagery Processing System - Navy
JSTARS	Joint Stand-off Target Attack Radar System
JTA	Joint Technical Architecture
KHz	KiloHertz
LFOC	Landing Force Operations Center
LRIP	Low Rate Initial Production
MAE	Medium Altitude Endurance
METC	Meteorological Center
MHz	MegaHertz
MIES	Modernized Imagery Exploitation System
MIL	Military
NITF	National Imagery Transmission Format
NSWCDD	Naval Surface Warfare Center Dahlgren Division
NTSC	National Transmission Standards Committee
ORD	Operational Requirements Document
PAL	Phase Alternate Line
PYLD	Payload
RDY	Ready
RGB	Red, Green, Blue
RM	Room
ROM	Read Only Memory

S	Special
SACC	Supporting Arms Coordination Center
SMPTE	Society of Motion Picture and Television Engineers
SPIRIT	Special Purpose Integrated Remote Intelligence Terminal
SQDN	Squadron
SSDD	System/Subsystem Design Description
SSS	System/Subsystem Specification
STD	Standard
T	Test
TAMPS	Tactical Aircraft Mission Planning System
TBMCS	Theater Battle Management Core System
TCS	Tactical Control System
TEG	Tactical Exploitation Group
TUAV	Tactical Unmanned Aerial Vehicle
TV	Television
UAV	Unmanned Aerial Vehicle
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
VCR	Video Cassette Recorder
VMF	Variable Message Format